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**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
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Seattle, WA 98115

Refer to:  
2003/00533

March 25, 2004

Mr. Robert E. Willis  
Chief, Environmental Resources Branch  
Department of the Army  
Portland District, Corps of Engineers  
P.O. Box 2946  
Portland, OR 97208-2946

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Construction of the Springfield Millrace Restoration Project, Middle Fork Willamette River, Lane County, Oregon

Dear Mr. Willis:

Enclosed is a biological opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) that addresses the proposed funding under section 206 of the Energy and Water Appropriations Bill of the Springfield Millrace Restoration Project within the Middle Fork of the Willamette River in Lane County, Oregon. NOAA Fisheries concludes in this Opinion that the proposed action is not likely to jeopardize Upper Willamette River chinook salmon (*Oncorhynchus tshawytscha*). This Opinion includes reasonable and prudent measures with terms and conditions that are necessary to minimize the potential for incidental take associated with this action.

This document also serves as consultation on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and implementing regulations at 50 CFR Part 600. This reach of the Middle Fork Willamette River has been designated as EFH for chinook salmon. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NOAA Fisheries within 30 days after receiving these recommendations. If the response is inconsistent with the recommendations, the action agency must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations.



If you have any questions regarding this consultation, please contact Dan Tonnes of my staff in the Willamette Habitat Branch of the Oregon State Habitat Office at 503.736.4743 or [Dan.Tonnes@NOAA.gov](mailto:Dan.Tonnes@NOAA.gov).

Sincerely,

*for Michael R. Crouse*

D. Robert Lohn  
Regional Administrator

cc: Kim Larson, COE

# Endangered Species Act - Section 7 Consultation Biological Opinion

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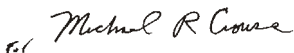
## Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

Springfield Millrace Restoration Project,  
Middle Fork Willamette River,  
Lane County, Oregon

Agency: U.S. Army Corps of Engineers, Portland District

Consultation  
Conducted By: NOAA's National Marine Fisheries Service,  
Northwest Region

Date Issued: March 25, 2004

Issued by:   
\_\_\_\_\_  
D. Robert Lohn  
Regional Administrator

Refer to: 2003/00533

## TABLE OF CONTENTS

1. INTRODUCTION .....	<a href="#"><u>1</u></a>
1.1 Consultation History .....	<a href="#"><u>1</u></a>
1.2 Proposed Action .....	<a href="#"><u>1</u></a>
2. ENDANGERED SPECIES ACT .....	<a href="#"><u>4</u></a>
2.1 Biological Opinion .....	<a href="#"><u>4</u></a>
2.1.1 Biological Information .....	<a href="#"><u>4</u></a>
2.1.2 Evaluating Proposed Actions .....	<a href="#"><u>4</u></a>
2.1.3 Biological Requirements .....	<a href="#"><u>5</u></a>
2.1.4 Environmental Baseline .....	<a href="#"><u>6</u></a>
2.1.5 Effects of Proposed Action .....	<a href="#"><u>7</u></a>
2.1.6 Cumulative Effects .....	<a href="#"><u>18</u></a>
2.1.7 Conclusion .....	<a href="#"><u>19</u></a>
2.1.8 Conservation Recommendations .....	<a href="#"><u>20</u></a>
2.1.9 Reinitiation of Consultation .....	<a href="#"><u>20</u></a>
2.2 Incidental Take Statement .....	<a href="#"><u>20</u></a>
2.2.1 Amount or Extent of the Take .....	<a href="#"><u>21</u></a>
2.2.2 Reasonable and Prudent Measures .....	<a href="#"><u>21</u></a>
2.2.3 Terms and Conditions .....	<a href="#"><u>22</u></a>
3. MAGNUSON-STEVEN'S FISHERY CONSERVATION AND MANAGEMENT ACT ..	<a href="#"><u>32</u></a>
3.1 Background .....	<a href="#"><u>32</u></a>
3.2 Identification of EFH .....	<a href="#"><u>33</u></a>
3.3 Proposed Action .....	<a href="#"><u>33</u></a>
3.4 Effects of Proposed Action .....	<a href="#"><u>34</u></a>
3.5 Conclusion .....	<a href="#"><u>34</u></a>
3.6 EFH Conservation Recommendations .....	<a href="#"><u>34</u></a>
3.7 Statutory Response Requirement .....	<a href="#"><u>34</u></a>
3.8 Supplemental Consultation .....	<a href="#"><u>34</u></a>
4. LITERATURE CITED .....	<a href="#"><u>35</u></a>

## **1. INTRODUCTION**

### **1.1 Consultation History**

On May 8, 2003, the National Marine Fisheries Service (NOAA Fisheries) received a biological assessment (BA) from the Corps of Engineers (COE) and a written request for consultation for the proposed funding and construction under section 206 of the Energy and Water Appropriations Bill of the Springfield Millrace Restoration Project near the Middle Fork Willamette River in Lane County, Oregon. In the letter and the BA, the COE initially determined that the proposed action is “not likely to adversely affect” Upper Willamette River (UWR) chinook salmon (*Oncorhynchus tshawytscha*) listed as ‘threatened’ under the ESA. On September 23, 2003, NOAA Fisheries issued a non-concurrence letter to the COE, identifying certain information needs to finish the consultation as a “likely to adversely affect” action. The COE responded on December 2, 2003, with a request for formal consultation, and the additional information necessary to complete consultation.

NOAA Fisheries listed UWR chinook salmon as threatened under the Endangered Species Act (ESA) on March 24, 1999 (64 FR 14308). NOAA Fisheries issued protective regulations for UWR chinook salmon under section 4(d) of the ESA on July 10, 2000 (65 FR 42422).

The objective of this Opinion is to determine whether the subject action is likely to jeopardize the continued existence of UWR chinook salmon.

The analysis also fulfills the essential fish habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2)). The objective of the EFH consultation is to determine whether the proposed action will adversely affect designated EFH for chinook salmon, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

### **1.2 Proposed Action**

The proposed action is the COE authorizing and funding, through section 206 of the Water Resources Development Act of 1996, the construction of the Springfield Millrace Restoration Project near the Middle Fork Willamette River. According to the BA, the project will:

- (1) Remove the millpond dam;
- (2) create a meandering channel, seasonal ponds, and wetlands in the millpond area;
- (3) remove non-native plant species and revegetate the riparian corridor along the upper millrace and around the former millpond;
- (4) remove several ‘high spots’ in the two to three locations in the middle and upper millrace;
- (5) construct a new inlet at Clearwater Park;

(6) place large woody debris (LWD) in the upper millrace and new channel through the pond; (7) create a small water supply pond to continue to supply emergency water to the McKenzie Forest Products mill; and (8) screen Gorrie Creek to prevent fish stranding in the Springfield Utility Board (SUB) percolation pond and the diversion to the McKenzie Forest Products pumphouse.

#### Construction/Grading

The construction activities will not require the development of any new roads, as existing access is sufficient for all work. All in-water work will be conducted during the preferred in-water work period of July 1 through August 31.

To enhance water delivery to the millrace complex, the COE will construct a permanent, stable new inlet in Clearwater Park to obviate the need for post-project maintenance dredging. The COE will install a culvert at the new entrance which will not increase flooding above existing conditions. Inlet construction will include the removal of up to 20 trees, which will be retained on site as LWD. A combination of silt fences and the installation of 'plugs' to isolate flows will be placed to minimize turbidity impacts downstream as the project area is graded. The 12-acre millpond area will be graded to create a meandering channel system with seasonally inundated ponds/sloughs and wetlands. As part of the grading, the COE will remove three 'high spots' in the upper millrace that currently cause backwater conditions and contribute to poor water quality conditions (28<sup>th</sup> Street Bridge, F Street Bridge, and gage location). The inlet construction will necessitate the removal of the existing boat launch parking lot, which will be moved to an upland site.

The 15-foot high millpond dam will be removed by isolating the work area by diverting water at the upper end of the millpond through a pipe which will allow flows to exit just downstream of the dam. Silt fencing will be placed within the clearing area beside and below the dam, while protective fencing will be placed near areas that will not be disturbed by equipment. The dam materials will then be removed and disposed of off-site. The former dam site and its pond will then be graded as described above.

The McKenzie Forest Products' pumphouse and sump will be removed and moved to an approximate 1.5-acre water supply pond to be created within the footprint of the former 30-acre millpond. This new water supply pond will be screened in accordance with NOAA Fisheries screening criteria<sup>1</sup> to prevent salmonid access and stranding.

At the downstream end of the project, the COE will construct recreational and educational features including: (1) A pervious, concrete trail along the south bank of the millrace extending from the existing parking area for approximately 1,600 feet; (2) a short boardwalk segment within the proposed wetlands for passive viewing (480 linear feet); (3) a restroom facility which

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<sup>1</sup> National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (<http://www.nwr.noaa.gov/1hydroweb/hydroweb/ferc.htm>).

will be plumbed to the existing City wastewater treatment facility; and (4) additional bank restoration downstream of the existing dam, including re-sloping and revegetation.

A stormwater detention and infiltration pond will be built beside the railroad refurbishing yard (Booth-Kelly site). The pond will be approximately 250 feet by 65 feet, 5 to 6 feet deep, and its capacity will be 1.8 acre-feet of water. The pond will be designed to treat zinc, copper, and lead. The pond will be a passive system, with periodic maintenance of sediments to maintain infiltration and reduce metal concentrations.

Initial site sediment testing was conducted several years ago, and the COE will also conduct additional sediment testing to more accurately determine if any materials will require disposal in an approved landfill. Testing will occur on the existing millpond, just upstream of the dam, and the stormwater detention/infiltration site. Those sediments that exceed thresholds<sup>2</sup> will be removed and disposed of at an approved landfill.

#### Riparian and Instream Restoration

Through a combination of invasive plant removal and native plantings, extensive vegetation enhancement will occur throughout the project area. The COE will plant a minimum 100-foot wide (30 m) riparian/upland forested buffer along the former millpond area, and restore an average 50-foot (15 m) riparian buffer on McKenzie Forest Products lands upstream of the existing millpond and to the extent of public ownership up to Clearwater Park (variable width). Elsewhere, the COE will remove non-native invasive species and underplant native trees and shrubs in the existing riparian zone (100-foot width) in Clearwater Park and SUB lands (approximately 18 acres of riparian zone along the upper Millrace, or 1.2 linear miles). LWD will be placed without artificial attachments in the upper millrace and former millpond channel and floodplain.

#### Herbicide Use

The COE has proposed use of Rodeo<sup>®</sup> and AquaMaster<sup>®</sup> herbicides to facilitate removal of grubbed blackberry and scotch broom crowns as part of riparian restoration. The COE has committed to the following project limitations to ensure that minimal effects to aquatic species occur from herbicide use:

- Application will be limited to fall when plants are becoming dormant.
- Application will occur with sport spraying techniques from a backpack mounted applicator.
- No broadcast spraying will occur.
- No herbicide application will occur after the first year, post-construction.
- Only glyphosate in the form of Rodeo, Aquamaster, or a similar formulation will be used for this project.
- No herbicides will be applied to open water (surface water) or applied to plants in standing water.

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<sup>2</sup> 'Thresholds' are identified within the Terms and Conditions of this document.

## **2. ENDANGERED SPECIES ACT**

### **2.1 Biological Opinion**

#### **2.1.1 Biological Information**

The listing status and biological information for UWR chinook salmon is provided in Myers *et al.* (1998).

The Middle Fork Willamette River downstream from Dexter Dam serves as spawning, rearing, and migratory habitat for UWR chinook salmon. Essential features of the area for the species are: Substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions (50 CFR 226). The proposed action may affect all of these essential habitat features.

Historically, the Middle Fork Willamette River was one of the major natural production areas for spring chinook salmon in the Upper Willamette basin. Mattson (1948) estimated the spring chinook run of the Middle Fork Willamette River subbasin to be 2,550 fish in 1947, accounting for 21% of the spawning population above Willamette Falls. Before construction of impassable dams, spawning occurred primarily in the North Fork of the Middle Fork Willamette, Salt Creek, Salmon Creek, and Fall Creek subbasins (Mattson 1948). Following construction of the dams it is believed that naturally-produced fish accounted for a small percentage of the returning adults in the Middle Fork Willamette. In 1993, ODFW began outplanting excess hatchery adult spring chinook salmon above the COE dams in the Middle Fork Willamette. In 2002, approximately 10% of the adult chinook returning to Dexter Ponds below Dexter Dam were unmarked. Returning UWR chinook salmon begin arriving in the proposed project area in early May. However, the bulk of the run returns in late May through June. The number of adult spring chinook salmon collected at the facility below Dexter Dam has ranged from 5,462 to 10,621 between 1996 and 2002.

Juvenile spring chinook salmon could be present in the project area during construction. A study conducted by ODFW and COE personnel in 2000 and 2001 found that downstream migration by juvenile chinook from Lookout Point Reservoir, just upstream from Dexter Reservoir, peaked in December. Therefore, relatively few juvenile UWR chinook salmon are expected at the project site during the in-water work period between July 1 and August 31.

#### **2.1.2 Evaluating Proposed Actions**

The standards for determining jeopardy and destruction or adverse modification of critical habitat are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). In conducting analyses of habitat-altering actions under section 7 of the ESA, NOAA Fisheries uses the following steps of the consultation regulations combined with the Habitat Approach (NOAA 1999): (1) Consider the status and biological requirements of the species; (2) evaluate the relevance of the environmental baseline in the action area to the

species' current status; (3) determine the effects of the proposed or continuing action on the species and whether the action is consistent with the available recovery strategy; (4) consider cumulative effects; and (5) determine whether the proposed action, in light of the above factors is likely to appreciably reduce the likelihood of species survival in the wild or destroy or adversely modify critical habitat. In completing this step of the analysis, NOAA Fisheries determines whether the action under consultation, together with cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species. If NOAA Fisheries finds that the action is likely to jeopardize the listed species, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

### **2.1.3 Biological Requirements**

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed salmonids is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species, taking into account population size, trends, distribution, and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list the species for ESA protection and also considers new data available that is relevant to the determination.

The relevant biological requirements are those necessary for UWR chinook salmon to survive and recover to a naturally-reproducing population level, at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance its capacity to adapt to various environmental conditions, and allow it to become self-sustaining in the natural environment.

For this consultation, the biological requirements are improved habitat characteristics that function to support successful adult and juvenile migration and rearing. UWR chinook salmon survival in the wild depends on the proper functioning of certain ecosystem processes, including habitat formation and maintenance. Restoring functional habitats depends largely on allowing natural processes to increase their ecological function, while removing adverse impacts of current practices. In conducting analyses of habitat-altering actions, NOAA Fisheries defines the biological requirements in terms of a concept called Properly Functioning Condition (PFC) and applies a "habitat approach" to its analysis (NOAA 1999a). The current status of UWR chinook salmon, based on their risk of extinction, has not significantly improved since the species were listed.

### **2.1.4 Environmental Baseline**

In step 2 of NOAA Fisheries' analysis, we evaluate the relevance of the environmental baseline in the action area to the species' current status. The environmental baseline is an analysis of the effects of past and ongoing human-caused and natural factors leading to the current status of the species or its habitat and ecosystem within the action area. The action area is defined by NOAA Fisheries' regulations (50 CFR 402) as "all areas to be affected directly or indirectly by the

Federal action and not merely the immediate area involved in the action.” The action area for this project, therefore, includes the new inlet of the millrace, and downstream 3,000 feet downstream the exit of the millrace water into the Middle Fork Willamette River.

The population status and biological information for UWR chinook salmon is provided in Myers *et al.* (1998). In general, the status of UWR chinook salmon populations is the result of several long-term, human-induced factors, such as habitat degradation, water diversions, or hydropower dams, that serve to exacerbate the adverse effects of natural environmental variability from such factors as drought, floods, and poor ocean conditions.

Releases of warm water from the upstream Dexter Reservoir in September and October are suspected to cause problems with chinook salmon egg incubation and early emergence of chinook salmon fry. In 2002, water temperatures reached 65°F during September. The Middle Fork Willamette River is on the Oregon Department of Water Quality (ODEQ) section 303(d) list for temperature. Construction of Lookout Point and Dexter Dam have blocked downstream transport of sediment from approximately 1,000 square miles of the Middle Fork Willamette River subbasin. Flood control operations at Dexter Dam have substantially decreased the magnitude and frequency of extreme high flow events in the Middle Fork Willamette River below the dam.

The proposed restoration site is within the historic channel meander zone of the Middle Fork Willamette River. The BA provides the following summary of current and historic conditions within the project area:

Historically, the Middle Fork Willamette River meandered over its floodplain extensively. Flows ranged from approximately 500 to over 100,000 cubic feet per second (cfs) (14-2783 cubic meters per second), and high flows created numerous side channels, oxbows, and other off-channel habitats. Soil maps (SCS 1987) indicate that the majority of the millrace was within the floodplain alluvial deposition zone and likely meander zone of the Middle Fork Willamette River or McKenzie River. It is likely that Jasper Slough, Gorrie Creek, and the millrace were all part of a complex system of braided channels and side channels that would have supported a diversity of vegetation communities such as wetlands, shrub, forested riparian zones, prairies, and upland terraces. The Willamette historically had a gallery riparian forest (primarily cottonwood) up to several miles wide. The millrace was probably excavated at least partially from an old side channel or meander and then continued on where the mills are in non-floodplain areas. The outlet falls over soft sedimentary bedrock in a series of cascades that may not have been excavated, but eroded naturally over the lifetime of the millrace.”

(COE 2003)

Gorrie Creek is actually a channel that was dug many years ago to deliver water to the SUB percolation pond. The BA continues:

The upper millrace still provides moderate quality habitat for fish and wildlife species, however, the backwater conditions caused by the dam and various high spots along the upper millrace pond up the water and contribute to high water temperatures and low DO. Runoff from private lands adjacent to the millrace and Jasper Slough contributes fecal coliform bacteria, nutrients, metals, and suspended solids. The riparian zone on SUB lands and in Clearwater Park is dominated by young deciduous forest (less than 50 years in age) with an understory generally dominated by non-native invasive species. On private lands, there is minimal riparian zone, typically dominated by Himalayan blackberries (*Rubus procerus*). (The millrace dam presents an upstream migration barrier to adult and juvenile salmonids).”

(COE 2003)

NOAA Fisheries believes that this is a reasonable summary of baseline conditions.

A USGS study was conducted in 1994 to sample fish tissue in the millpond (USGS 1997). They assessed organochlorine pesticide and PCB concentrations in fish tissue; hormonal concentrations in fish tissue; concentrations of PAHs, phenols, and phthalates in bed sediments; and dissolved pesticides in water. Organochlorine pesticides were detected at 139 µg/kg in adult carp in the millpond. Phenols were detected in bed sediments at 1019 µg/kg, phthalates at 368 µg/kg, and PAHs at 623 µg/kg. The COE also detected phenols in sediment sampling in 2001 at concentrations ranging from 210 to 580 µg/kg, which is significantly lower than the concentrations found in 1995 (USGS 1997). The source of phenols is not known, however, it may be from industrial uses or wood waste. Stormwater runoff enters the millpond from the McKenzie Forest Products log yard.

### **2.1.5 Effects of Proposed Action**

Under the proposed action, adverse effects to listed fish and their habitat will result from the proposed construction activities. Biological requirements affected by the project include flow regime, water quality, and structural habitat condition.

#### Sediment Mobilization and Deposition

A number of the proposed construction activities are likely to disturb riparian and instream substrate within the project site. A number of provisions, such as work site isolation with berms, and silt fences, will be used to minimize sediment mobilization within and delivery to surface waters. However, given the scope of the project area and degree of soil and substrate disturbance, adverse effects to fish and aquatic habitat are likely to occur.

Earth and stream substrate-disturbing activities, including excavation, stockpiling, vegetation manipulation, and construction, can result in increased delivery of sediment to streams, and increased turbidity in the water column. The severity of the effect depends on numerous factors, including the amount of ground-disturbing activity, slope, amount of vegetation removed, timing of work, and weather. Sediment introduced into streams can degrade spawning and incubation

habitat, and can negatively affect primary and secondary productivity. This may disrupt feeding and territorial behavior through short-term exposure to turbid water.

#### Contaminated Sediments

Based on sediment sampling results provided by the COE, the excavation of bottom material in some areas in the millrace could potentially disturb sediments contaminated with various metals, PAHs, phenols, and phthalates. The sequencing of construction activities as described in the BA and section 1.2 of this Opinion, and the removal of excavated bottom materials from known contaminated sites to upland sites where they cannot enter streams or other waterbodies are expected to minimize the potential for transport of contaminated sediment from the millrace to the Middle Fork Willamette River.

Sediment testing conducted before substrate grading may identify elevated concentrations of various metals, PAHs, phenols, and phthalates at concentrations that can cause sublethal effects to juvenile salmonid fishes. These sublethal effects include, but are not limited to, gill dysfunction, inhibition of gill  $\text{Na}^+ \text{K}^+$  ATPase activity, reduced growth, altered hematology, respiratory stress, and diminished responsiveness in juvenile salmonid fishes (Sorensen 1991).

Since sediment characterization has not been determined, it is not possible to determine the amount or distribution of contaminants that would remain following dredging completion. Removal of contaminated sediments from this area would likely reduce the total contaminant load and result in localized ecological benefits, but cells of contaminants may remain just outside the proposed dredge areas. In the absence of definitive information, NOAA Fisheries makes the biologically conservative assumption that UWR chinook are likely to continue to be exposed to contaminants at concentrations likely to cause sublethal effects. These contaminants are likely to be mobilized within the project area, and transferred downstream in the Middle Fork Willamette River.

The effects of suspended sediment and turbidity on fish are reported in the literature as ranging from beneficial to detrimental, though the vast majority of literature reports negative consequences from anthropogenic or naturally-induced sediment regime changes. Elevated total suspended solids (TSS) conditions have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival. Elevated TSS conditions have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Factors influencing detrimental effects of TSS on fish are the season, frequency and duration of the exposure (not just the TSS concentration,) and the lifestage of the species.

Behavioral avoidance of turbid waters may be one of the most important effects of suspended sediments (DeVore *et al.* 1980; Birtwell *et al.* 1984; Scannell 1988). Salmonids have been observed to move laterally and downstream to avoid turbid plumes (McLeay *et al.* 1984, 1987; Sigler *et al.* 1984; Lloyd 1987; Scannell 1988; Servizi and Martens 1991). Juvenile salmonids tend to avoid streams that are chronically turbid, such as glacial streams or those disturbed by human activities, except when the fish need to traverse these streams along migration routes (Lloyd *et al.* 1987). In addition, a potentially positive reported effect is additional refuge and

cover from predation (Gregory and Levings 1988), though this circumstance is thought to be limited.

Construction activities and the reestablishment of flows to the restoration site are likely to cause delivery and deposition of sediment within the millrace and downstream habitat in the Willamette, which may have some suitable substrates for spawning chinook. Fine sediment can act as a physical barrier to fry emergence (Cooper 1959, 1965; Wickett 1958; McNeil and Ahnell 1964), and McHenry *et al.* (1994) found that fines (>13 % of sediments < 0.85mm) resulted in intragravel mortality of salmonid embryos due to oxygen stress and metabolic waste build-up. Deposited sediment can cover intragravel crevices that juvenile salmonids use for shelter, in turn decreasing the carrying capacity of streams for juvenile salmon (Cordone and Kelley 1961; Bjornn *et al.* 1974). Particulate materials physically abrade and mechanically disrupt respiratory structures (fish gills) and respiratory epithelia of benthic macroinvertebrates (Rand and Petrocelli, 1985).

Fine sediment can also affect listed the food supply for fish by embedding gravels and cobble, thus reducing accessibility to microhabitats and burying and suffocating benthic organisms that salmonids eat (Brusven and Prather 1974). When fine sediment is deposited on gravel and cobble, benthic species' diversity and densities have been documented to drop significantly (Cordone and Pennoyer 1960; Herbert *et al.* 1961; Bullard 1965; Reed and Elliot 1972; Nuttall and Bilby 1973; Bjorn *et al.* 1974; Cederholm *et al.* 1978). Reduced prey availability could contribute to reduced growth and survival of juvenile listed fish.

Sediment deposition and increased temperatures can lead to decreased levels of dissolved oxygen (DO). In addition to the potential lethal effects of low DO, sublethal effects can occur. Bjornn and Reiser (1991) determined that growth and food conversion efficiency are affected at DO levels of less than 5mg/L. Phillips and Campbell (1961) determined that DO levels must average greater than 8mg/L for embryos and alevins to have good survival rates. Silver *et al.* (1963) and Shumway *et al.* (1964) observed that chinook salmon reared in water with low or intermediate oxygen levels were smaller-sized and had a longer incubation period than those raised at high DO levels. Low DO levels increased the incubation periods for anadromous species, and decreased the size of alevins (Garside 1966; Doudoroff and Warren 1965; Alderice *et al.* 1958).

Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Redding *et al.* 1987; Lloyd 1987; Servizi and Martens 1991). Exposure duration is a critical determinant of the occurrence and magnitude of physical or behavioral effects (Newcombe and MacDonald 1991).

Practices that isolate work areas from active flow of water will minimize turbidity. However, even the activity needed to isolate the stream may cause at least minimal water quality impacts. It is also common that re-introduction of the stream to a newly-constructed project will introduce some level of turbid waters downstream. To address this issue, the project will include a ramping of flow re-introduction to the project site to minimize this additional sediment mobilization.

Because of conservation measures, sediment effects are likely to be transitory in nature, and constrained by the preferred timing windows. However, given the extensive channel grading that is proposed, any juvenile chinook that are not captured and removed from the work area have a relatively high probability of injury or death from work area turbidity.

#### Other Effects from In-Water Work

Due to the construction timing window, juveniles may be more prevalent during construction periods and subject to greater exposure to the effects of in-water work. Changes of stream flows in the project area could contribute to displacement from preferred habitats, and could contribute to a decrease in the spatial and temporal extent of water velocities within the tolerance of juvenile chinook salmon.

While these effects are anticipated, performing the work within the construction window and removing juveniles in the project area before earth disturbance activities begin will greatly decrease the numbers of juvenile chinook exposed to adverse effects from velocity changes.

#### Fish Sampling and Removal from Habitat

Work area isolation is a conservation measure intended to reduce the adverse effects of erosion and runoff on the population, by reducing the exposure of fish to work occurring in the channel. This is accomplished by capturing and releasing any individual fish present in the work isolation area.

Capturing and handling fish causes them stress, though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death from handling are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps, if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis.

#### Equipment Spills

Construction near and within the project area includes the risk that toxic or harmful substances, including fuel, oil, and grease, may leak or be spilled from equipment. These can be acutely toxic to fish at high levels of exposure, and cause acute and chronic lethal or sub-lethal effects on

salmonids, aquatic invertebrates, and aquatic and riparian vegetation. The COE will have hazardous spill clean-up materials on site and any machinery maintenance involving potential contaminants, such as fuel, oil, or hydraulic fluid, will occur at an approved site or outside the riparian area, and before starting work each day, all machinery will be checked for leaks. These measures should greatly decrease the likelihood of equipment spills, and subsequent impacts if they occur.

#### Effects of Rodeo® or AquaMaster® Application

The effects of chemical herbicide use frequently extend beyond the intended target species. Herbicide composition, including inert ingredients, such as carrier agents, and surfactants, chemical character, environmental conditions, and application techniques are among the parameters that determine the degree to which herbicide effects will impact non-target species and their ecosystems. Scientific studies have documented lethal effects, and to a lesser degree, sublethal effects of herbicide ingredients on many species. These studies are typically laboratory-derived. Conditions in the field may exhibit a greater variability in toxicity (Henry *et al.* 1994) with pre-existing conditions ameliorating effects in some instances and amplifying effects in others. Sublethal effects on fish of herbicide use may include reduced growth, decreased reproductive success, altered behavior, and reduced resistance to stress (Spence *et al.* 1996).

Aquatic biota may be direct exposure to herbicides where they are applied directly to stream channels. However, risks of contamination can be reduced if adequate no-spray buffers are maintained (Heady and Child 1994). The risk is further reduced by use of hand application techniques, as opposed to aerial application, and adherence to conservation measures that minimize the risk of drift or exposure resulting from spill events. However, as Spence *et al.* (1996) state, “toxic levels of chemicals may reach streams from storm runoff and wind drift even when best management practices are employed.”

Indirect exposure vectors may result from surface and subsurface transport. Potential habitat responses include reduction in riparian vegetation, increased aquatic solar radiation, elevated stream temperatures, and reduced prey base. The loss of riparian vegetation may also decrease the amount of organic litter and large wood delivered to streams. Furthermore, bank instability may result from the loss of vegetation root structure, increasing sedimentation and reducing cover for fish.

In addition to effects of active ingredient toxicity, inert ingredient toxicity is frequently overlooked and is often little studied or understood. Similarly,  $LC_{50}$  values may not be adequate to predict adverse effects in the context of the ESA. By definition,  $LC_{50}$  values indicate the concentration at which half of the subject species dies as a result of exposure. Therefore, clearly any concentrations that approach the  $LC_{50}$  values can be construed to constitute adverse effects. While sublethal effects equally constitute adverse effects in terms of the ESA, the concentrations that result in such effects remain imprecise.

The Rodeo® (Dow Agrosiences) and AquaMaster® (Monsanto) formulations are comprised of 53.8% glyphosate and 46.2% water (the carrier agent). These two formulations are comparable. Toxicity information presented herein for the Rodeo® formulation also applies to the AquaMaster® formulation.

Glyphosate is a non-selective, broad-spectrum herbicide. Absorbed by leaves and translocated throughout the plant, glyphosate disrupts the photosynthetic process by preventing the synthesis of amino acids required for the construction of proteins. The herbicide affects a wide variety of plants, including grasses and many broadleaf species, and has the potential to eliminate desirable as well as undesirable vegetation. Plant selectivity can be achieved by using injection or wiping application methods.

Glyphosate is strongly adsorbed by soil and does not retain herbicidal properties following contact with soil. Some information indicates the presence of phosphate ions may impair or reverse glyphosate adsorption (Norris *et al.* 1991). The half-life of glyphosate in soil can range from three to 249 days (FS 2000). In general, glyphosate degradation is dependent on soil texture and organic content (FS 2000). Degradation is rapid in soils of low organic content, and slower in soils with high organic content (Tu *et al.* 2001). “Strong adsorption to soil particles slows microbial degradation, allowing glyphosate to persist in soils and aquatic environments” (Tu *et al.* 2001). Adsorption increases with increasing clay and organic content (FS 2000, Tu *et al.* 2001). The main breakdown products of glyphosate are aminomethylphosphonic acid (AMPA) or glycine, which are further broken down by soil microorganisms (Norris *et al.* 1991).

Glyphosate dissolves easily in water (Norris *et al.* 1991). However, because glyphosate is strongly adsorbed by soil particles, it is not easily released back into water moving through soil. In the project area, glyphosate has the greatest potential to enter flowing water due to direct deposition from drift or accidental spill during application. Indirect contamination may result from over-ground runoff that transports contaminated soil particles to waterways during spring and fall rains, or from inundation of treatment sites in floodplains. Glyphosate entering the water may be quickly bound to sediment and suspended particulates (Solomon and Thompson 2003), although some studies indicate it may remain in freshwater a “long time” (Anton *et al.* 1994). Tests show that the half-life for glyphosate in water ranges from 35 to 63 days. In British Columbia, following application of glyphosate using a no-spray buffer and very low concentrations of glyphosate, the breakdown product AMPA were sometimes observed in water and sediments of streams after the first heavy rain following application (FS 2000). These findings were consistent with a study (where glyphosate was applied to agricultural watersheds) that found the highest concentrations in runoff one to 10 days, and detection up to 4 months, after application (Norris *et al.* 1991). The same study found the maximum amount of herbicide transported by runoff was 1.85% of the applied amount, and that in each of the three study years, “the first runoff event after treatment accounted for 99% of the total herbicide runoff...” (Norris *et al.* 1991). In over-water applications, higher peak concentrations were always observed in water following heavy rain events up to three weeks after application, and sediment peaks were observed later and persisted in stream sediments for more than one year (FS 2000).

### Habitat Effects

By design, use of glyphosate would reduce streambank and floodplain vegetation, including any treated native vegetation. Elimination of the blackberry and scotch broom may result in small, short-term increases of direct solar radiation reaching adjacent waters and contribute to elevated water temperatures. However, these plants are generally low-lying, thus NOAA Fisheries does not expect measurable increases in-water temperature resulting from herbicide use. In the long term, the re-establishment of natural vegetation should restore shade and reduce water temperature turbidity.

### Biological Effects

Glyphosate is “moderately to very slightly toxic” to fish (Table 1) (Mensink and Janssen 1994). The Material Safety Data Sheet for Rodeo® indicates the acute LC<sub>50</sub> for rainbow trout of the 53.8% glyphosate formulation is 60 ppm (Dow 2000). This reflects the toxicity of application methods that do not dilute the formulation (*e.g.*, injection, wiping).

Glyphosate sub-lethal effect concentrations for salmonids have not been well studied. However, a study using carp found histopathological changes in gills and liver structure, as well as in liver, heart, kidney, and serum enzyme activity following exposure (14 days) to sub-lethal glyphosate concentrations (Neskovic *et al.* 1996). The threshold gill and liver histopathological responses were observed at concentrations equal to 0.8% (5 ppm) and 1.6% (10 ppm), respectively, of the 96-hour LC<sub>50</sub> for that species (620 ppm). The gill histopathological response was thought to be reparable if the fish were relocated to uncontaminated water; however, the liver fibrosis could be indicative of serious liver damage. Statistically significant changes in enzyme activity were observed at 0.4% of the 96-hour LC<sub>50</sub>, (the lowest exposure concentration) in liver (alkaline phosphatase,  $P < 0.01$ ; and glutamic-pyruvic transaminase,  $P < 0.05$ ) and kidneys (glutamic-oxaloacetic transaminase,  $P < 0.05$ ; and glutamic-pyruvic transaminase,  $P < 0.05$ ). Responses to chemical exposure vary by species, but equivalent exposure concentrations (0.4%, 0.8%, and 1.6% of the 96-hour LC<sub>50</sub>) for salmonids would be 4.4 ppm, 8.8 ppm, and 17.6 ppm.

Glyphosate (Roundup® formulation) exposure tests with rainbow trout found that the most sensitive life stage were sac-fry, followed by emergent fry (Norris *et al.* 1991). Eyed eggs were the most resistant life stage. At a given life stage, there is some suggestion that toxicity does not significantly ( $P < 0.05$ ) differ based on specimen size (Mitchell *et al.* 1987). Osmoregulatory function in coho salmon smolt exposed to low concentrations (~50% LC<sub>50</sub> value) of Roundup® was not found to be affected (Mensink and Janssen 1994, section 9.1.2.3). Although exposure via ingestion has been demonstrated (Henry *et al.* 1994), studies on carp suggest glyphosate has a low potential for bioconcentration (FS 2000).

Glyphosate formulations are “moderately to very slightly toxic to aquatic invertebrates (Mensink and Janssen 1994, section 9.1.2.2). The 96-hour LC<sub>50</sub> values range from 218 to 1,216 ppm (Henry *et al.* 1994) (Table 1). Exposure may occur by ingestion of contaminated particulates, and increased suspended solids may increase toxicity. Additions of clay increased toxicity to *Daphnia* (Mensink and Janssen 1994). Conversely, toxicity to *Daphnia* was decreased by aeration (Mensink and Janssen 1994). Therefore, glyphosate in well-oxygenated, turbulent

streams (*e.g.*, headwater streams) with few suspended solids may be less toxic to aquatic invertebrates than slow-moving rivers with high levels of suspended solids (*e.g.*, lower river reaches). Aeration did not affect toxicity to rainbow trout (Mensink and Janssen 1994, section 9.1.2.3). Mayfly nymphs did not avoid low concentrations (0.2 to 2 ppm) of the Roundup<sup>®</sup> formulation, however, the nymphs avoided concentrations equal to the 96-hour LC<sub>50</sub> value (Mensink and Janssen 1994). Aquatic macroinvertebrate density declined by 42% for a 1.5 year period following treatment with Roundup<sup>®</sup> (Spence *et al.* 1996).

Glyphosate toxicity is affected by environmental factors (*e.g.*, water hardness, temperature, or pH) (Mitchell *et al.* 1987, Norris *et al.* 1991, Anton *et al.* 1994, Henry *et al.* 1994, Mensink and Janssen 1994, SERA 1997). Toxicity increases at lower pH levels and higher temperatures (Henry *et al.* 1994; Mensink and Janssen 1994, section 9.1.2.3; SERA 1997). With regard to pH, surfactants may have the opposite relationship and exhibit increased toxicity in alkaline waters (SERA 1997, FS 2000).

Surfactants would not be used with the injection or wicking methods. However, the surfactant LI700 would be used in areas where stems are too small for injection, and foliar spray application is used. The aquatic toxicity of surfactants recommended for use with Rodeo<sup>®</sup> varies greatly, though the toxicity of the proposed surfactant (*i.e.*, LI-700<sup>®</sup>) is relatively low (Table 1). Surfactants would constitute 1% or less of the applied herbicidal solution. LI-700<sup>®</sup> (Loveland Industries, Inc.) consists of phosphatidylcholine, propionic acid, and alkylpoloxyethylene ether (80%). The remaining 20% is identified only as “constituents ineffective as adjuvant” (SERA 1997). The additive effect of the surfactant on the toxicity of the applied solution is poorly understood. SERA (1997) reported, “data appear to be inadequate for a quantitative assessment of ecological effects of the surfactant,” LI-700<sup>®</sup>. Glyphosate has been found to have an antagonistic effect on the toxic action of a surfactant (Mensink and Janssen 1994). The actual toxicity of the applied solution is likely between that identified for a 5% Rodeo<sup>®</sup> solution and the surfactant alone (Mitchell *et al.* 1987). Henry *et al.* (1994) found Rodeo<sup>®</sup> and the adjuvants X-77 Spreader<sup>®</sup> and Chem-Trol<sup>®</sup> were additive in toxicity to amphipods.

The glyphosate formulations (Rodeo<sup>®</sup> or AquaMaster<sup>®</sup>) proposed for use under this action, were selected for their low relative toxicity compared to other available formulations. By comparison, the LC<sub>50</sub> of Roundup<sup>®</sup> (glyphosate + EntryII<sup>®</sup> surfactant) to fish is 5 to 26 ppm and the LC<sub>50</sub> of R-11<sup>®</sup> (a common surfactant used with glyphosate) to fish is 3.8 ppm (SERA 1997).

**Table 1.** The Aquatic Toxicity of Glyphosate, Rodeo® or an Equivalent Formulation, and the Proposed Surfactant (LI-700®).

LC<sub>50</sub>= concentration lethal to 50% the sample population.

EC<sub>50</sub>= concentration at which 50% of the sample population exhibits an effect.

NOEC = concentration at which no observable effects are noted among the sample population.

	Glyphosate	Rodeo® or equivalent	LI-700®
Salmonid 96-hourr NOEC	823 ppm <sup>(1)</sup>	1,500 ppm <sup>(1)</sup>	<100 ppm <sup>(5)</sup>
Salmonid 24-hour LC <sub>50</sub>		60 ppm <sup>(4)</sup>	140 ppm <sup>(5)</sup>
Salmonid 48-hour LC <sub>50</sub>			130 ppm <sup>(5)</sup>
Salmonid 96-hour LC <sub>50</sub>	580 ppm <sup>(2)</sup>	1,100 ppm <sup>(2)</sup>	130 ppm <sup>(5)</sup>
Invertebrate 48-hour NOEC			100 ppm <sup>(5)</sup>
Invertebrate 48-hour EC <sub>50</sub>	55 ppm <sup>(3)</sup>	5,600 ppm <sup>(3)</sup>	
Invertebrate 24-hour LC <sub>50</sub>			450 ppm <sup>(5)</sup>
Invertebrate 48-hour LC <sub>50</sub>	117 - 930 ppm <sup>(3)</sup>	218 -1,216 ppm <sup>(3)</sup>	170 ppm <sup>(5)</sup>
Invertebrate 96-hour LC <sub>50</sub>		720- 1,177 ppm <sup>(3)</sup>	190 ppm <sup>(6)</sup>

(1) Anton *et al.*

(2) Mitchell *et al.* 1987.

(3) Henry *et al.* 1994.

(4) Dow 2000.

(5) Loveland Industries, Inc. 2000.

(6) FS 2000.

### Vectors of Exposure.

Spot spraying would avoid direct contamination from drift and indirect contamination from runoff since the herbicide would remain contained in the applicator or the plant itself, resulting in no soil contamination. A spill event could result in localized and short-term effects. NOAA Fisheries expects that the best management practices (BMPs) and project design features to be implemented for this project will minimize the potential for a spill to occur.

Direct contamination may cause an effect on fish or invertebrates present in proximity to a stream entry point. The effect will largely be dependent on the degree and extent of contamination and the ability or inclination of the organism to avoid exposure. The temporal and spatial extent of exposure would depend on the mixing zone needed to reduce contamination levels below the effect threshold concentration.

Mixing zone size would vary greatly and depend on the contamination volume (*e.g.*, drift or spill), the receiving volume (*e.g.*, 1 cfs or 30 cfs), the point of entry (*e.g.*, drift deposition or gravel bar inundation), and the amount of turbulence (*e.g.*, step-pool, slack water side channel), Hydrologically complex waterways with meanders, pools, riffles, and eddies that accelerate

mixing and dilution are more likely to disperse contaminants than simplified waterways with consistent channel velocities that allow contaminants to maintain a more consolidated profile (Lee 1995, Heard *et al.* 2001). Mixing distances are shorter in smaller streams and mixing is slower when the discharge point is near the streambank (Heard *et al.* 2001). A recent study of transverse mixing distances in small streams ( $1.4$  to  $3.5 \text{ feet}^3 \text{ s}^{-1}$ ) in eastern Iowa found heterogeneity in tracer concentrations  $16.4$  feet to more than  $328$  feet downstream of mid-channel release points (Heard *et al.* 2001). Unfortunately, short of empirically determining mixing distances for specific stream reaches, the ability to predict mixing lengths quantitatively is not yet feasible (Heard *et al.* 2001).

Rainbow trout fry have been observed to avoid glyphosate (Vision<sup>®</sup>) at concentrations equal to  $50\%$  of the  $LC_{50}$  value (Morgan *et al.* 1991). Vision<sup>®</sup> is a glyphosate salt formulation containing either  $10\%$  or  $15\%$  surfactant (similar to Roundup<sup>®</sup>). The same study (Morgan *et al.* 1991) found juvenile rainbow trout did not avoid UWR chinook salmon may not avoid exposure to lower glyphosate concentrations by relocating. Sublethal effects on fish have been documented at exposures for various contaminants at concentrations less than  $1\%$  of their  $LC_{50}$  value.

As stated above, all of the applications will occur in early to mid-fall (late September through October). Some juvenile UWR chinook salmon rear in the Willamette River year-round.

Any contamination of flowing water is expected to move downstream and decline rapidly as mixing occurs and glyphosate binds to particulates (Solomon and Thompson 2003), although elevated concentrations may persist in near bank areas, eddies, and side channels with slower velocities. The preponderance of evidence suggested by the literature indicates that the use of glyphosate near the water poses a minimal risk of long-term adverse affects on salmonids or their prey base (Morgan *et al.* 1991, Norris *et al.* 1991, Anton *et al.* 1994, Gardner and Grue 1996, Simenstad *et al.* 1996, FS 2000, Kilbride and Paveglio 2001). Any affects to freshwater invertebrates would likely be of limited temporal and spatial extent as well. Therefore, any contamination would represent short-term, non-lethal exposure for UWR chinook salmon, and would not significantly reduce their prey base. To some extent this finding is based on the assumption that existing background chemical contamination is minimal and not of such character as to cause a synergistic or threshold effect to occur.

#### Long-Term Habitat Improvement

On completion of the project, the project area will feature enhanced habitat functions that currently limit the capacity of the Middle Fork Willamette to ensure survival and recovery of UWR chinook. Virtually all of the habitat elements designated as essential features of the area for the species, including substrate, water quality, water temperature, water velocity, cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions (50 CFR 226) will be improved after completion of the project. These improvements will be most pronounced within the project area, though habitat downstream of the project will derive incremental improvements for some of the essential habitat elements as well.

The millrace will provide improved functions consistent with floodplain processes degraded in the action area. Off-channel habitat for juvenile UWR chinook salmon will be improved with increased edge habitat throughout the meandering channels and ponds. Edge habitat<sup>3</sup> provides cover from predators, reduced velocities that facilitate rest and efficient energy expenditure while foraging. An increased volume of quality edge habitat can decrease density-dependent rearing constraints that may limit juvenile UWR chinook growth before migrating to the Columbia estuary and ocean habitats. In addition to an increased volume of edge habitat, existing edge habitat will be improved through the placement of LWD, removal of invasive riparian species, and planting of native willows and conifers. Blackberry and scotch broom can dominate riparian habitats, reducing or eliminating native shrub and tree growth. In turn, shade and large wood recruitment to the channel are reduced. Over time, increased shade will reduce solar heating and subsequent reduced volumes of DO. Removal of the three 'high spots' in the millrace will reduce ponding and the existing ponding of water that result in temperature increase. Cooler temperatures and in-channel wood will increase primary and secondary production within the millrace, and enhance prey sources for juvenile UWR chinook salmon.

Water quality improvements and increased/improved edge habitat may reduce competition from non-native fish species, which may include largemouth bass, white and black crappie, brown bullhead, bluegill, carp, and mosquito fish. Of these, largemouth bass, white and black crappie, and brown bullhead also prey on salmon fry and juveniles. These non-native species are likely to continue to inhabit the project area to some extent after completion of the proposed restoration activities. The non-native predator species are primarily warm water fish, and have done well in the current condition of the project area. The warm water species prefer dense aquatic vegetation (such as milfoil) and are more active in foraging from April or May through October. Non-native, warm water, piscivorous fish predation may be inhibited if water temperatures are lowered since they become generally inactive at water temperatures below 55°F (13°C). Juvenile UWR chinook salmon would most likely use the ponds from November through May, before migrating downstream. Some temporal overlap between the juvenile UWR chinook salmon and their predators will still occur, though the project would reduce predation on UWR chinook salmon.

Removal of the millrace dam will enable uninhibited passage for adult and juvenile UWR chinook at this site. This will enable juveniles to enter off-channel habitat, particularly during high flows, where access has been blocked for many decades. Depending on the size of the juveniles, access to the millrace during high flows may be volitional or non-volitional. In either case, the ability of juveniles to use this area as a refuge from high flows may reduce the danger of premature migration.

Removal of contaminated sediments, if necessary, will further enhance aquatic system health by potentially increasing benthic food production and non-lethal or lethal exposures to contaminants.

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<sup>3</sup> Defined as the slack water channel margin between the shear line of the thalweg and the bank edge (Haas and Collins, 2001).

After re-introduction of water into the millrace, an adjustment period with some bedload movement will occur. The extensive grading, creation of meandering channels, removal of three high spots, and removal of the millrace dam all lead to morphological adjustment and bedload movement. Bedload movement will likely occur over a decade or more, due to the limited maximum CFS allowed in the millrace for flood control purposes (350 cfs) and the large area that will be subject to change. The effects to the aquatic system from bedload movement in the millrace are likely to be neutral. Bedload movement will result in incremental turbidity plumes and a possible channel boundary adjustment. These morphological changes occur in nearly all aquatic systems that support anadromous fish, and many of these changes result in positive contributions to habitat functions, including wood recruitment, flushing of sediment from spawning grounds, and creation of new off channel habitat, among others. The most significant bedload movement may occur near the old millrace dam site, though the grading and contouring of the site will reduce bedload movement often associated with dam removal. The resulting off channel habitat will provide refuge from the mainstem Willamette during high flows, increasing the quality and quantity of off channel habitat. In addition, juvenile chinook will be able to exit the former site of the dam and volitionally re-join the mainstem, which should lead to less predation impacts compared to pre-project conditions.

The COE listed six State permitted withdrawals totaling 3.82 cfs, four adjudicated withdrawals totaling 20.2 cfs, and nine non-permitted withdrawals totaling 28.6 cfs, thus at least 53 cfs of permitted and non-permitted water withdrawals occur throughout the project area for private, municipal and industrial use (COE 2003a). Consumptive water use can lead to a variety of negative effects within aquatic systems, ranging from usable area loss, increased temperatures, and a reduction in channel forming events, among others (Spence *et al.* 1996). These effects vary greatly depending on the timing and volume of withdrawals, and the relative environmental baseline of the aquatic system. Of these withdrawals, the only one effected by the project will be the relocation of the McKenzie Forest Products pumphouse and sump to a 1.5 acre water supply pond to be created within the footprint of the former 30-acre millpond. The project will not enable an increase or decrease of the consumptive use of water within the project area. Nonetheless, these existing water withdrawals likely effect the Middle Fork Willamette aquatic habitats in ways consistent with other consumptive water uses, though the degree of these effects is unknown.

The screening of Gorrie Creek, and the McKenzie Forest Products pumphouse will eliminate or drastically reduce the direct injury or death of juvenile UWR chinook at these water withdrawals.

### **2.1.6 Cumulative Effects**

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation."

NOAA Fisheries is not aware of any specific future non-federal activities within the action area that would cause greater effects to listed species than presently occurs. Between 1990 and 2000, the population of Lane County increased by 14.2%.<sup>4</sup> Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, increasing as population density rises. As the human population in the state continues to grow, demand for actions similar to the subject project likely will continue to increase as well. Each subsequent action may have only a small incremental effect, but taken together they may have a significant effect that would further degrade the watershed's environmental baseline and undermine the improvements in habitat conditions necessary for listed species to survive and recover.

### **2.1.7 Conclusion**

The final step in NOAA Fisheries' approach to determine jeopardy is to determine whether the proposed action is likely to appreciably reduce the likelihood of species survival or recovery in the wild. NOAA Fisheries has determined that when the effects of the proposed action addressed in this Opinion are added to the environmental baseline and cumulative effects occurring in the action area, it is not likely to jeopardize the continued existence of UWR chinook salmon.

NOAA Fisheries used the best available scientific and commercial data to apply its jeopardy analysis, when analyzing the effects of the proposed action on the biological requirements of the species relative to the environmental baseline, together with cumulative effects. NOAA Fisheries believes that the proposed action would cause a minor, short-term degradation of UWR chinook salmon habitat due to increased stream turbidity resulting from the extensive grading of the project area, removal of the millpond dam, excavation of the new upstream intake and placement of LWD. The level of direct mortality is expected to be minimal and would not result in jeopardy.

These conclusions are based on the following considerations: (1) All in-water work will be completed within the preferred in-water work window for the Middle Fork Willamette River in the project area between July 1 and August 31, when few juvenile salmon are expected to be in the action area; (2) in-water work area isolation and the conservation measures listed in the BA will be implemented to avoid or minimize adverse effects to water quality; (3) the removal of the millrace dam, enhancement and increase of edge habitat through grading and riparian improvements is expected to increase aquatic habitat complexity at the project site; (4) installation of the stormwater treatment ponds and the possible removal of contaminated sediments will enhance water quality; and (5) screening of the water diversions will prevent juvenile entrainment. The proposed action is not likely to impair properly functioning habitat, appreciably reduce the functioning of already impaired habitat, or retard the long-term progress of impaired habitat toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale.

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<sup>4</sup> U.S. Census Bureau, State and County Quickfacts, Coos County, Oregon. Available at <http://quickfacts.census.gov/qfd/states/41/41039.html>

## **2.1.8 Conservation Recommendations**

Section 7 (a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of a proposed action on listed species, to minimize or avoid adverse modification of habitats, or to develop additional information. NOAA Fisheries believes the following conservation recommendations are consistent with these obligations, and therefore should be carried out by the COE. This information will help to reduce uncertainty about the effects of past and ongoing human and natural factors leading to the status of listed salmon and steelhead, their habitats, and the aquatic ecosystem within the action area.

1. The COE should conduct a comprehensive assessment of water withdrawals within the millrace area. The assessment should determine the timing and quantity of actual withdrawals, and the adequacy (or existence) of fish screens.
2. The COE should assist consumptive water users to maximize the efficiency of conveyance systems, consolidate and screen diversions and time withdrawals to periods of least aquatic system harm.

## **2.1.9 Reinitiation of Consultation**

Consultation must be reinitiated if: (1) The amount or extent of taking specified in the incidental take statement is exceeded, or is expected to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not previously considered; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16). In instances where the amount or extent of authorized incidental take is exceeded, any operations causing such take must cease pending reinitiation of consultation.

If the applicant fails to provide specified monitoring information by the required date(s) NOAA Fisheries will consider that a modification of the action, that causes an effect on listed species not previously considered. Also, if water withdrawals at the McKenzie Forest Product and/or the Springfield Utility Board percolation pond are to be increased above current, actual volumes, consultation needs to be reinitiated.

## **2.2 Incidental Take Statement**

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” [16 USC 1532(19)] Harm is defined by regulation as “an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by

significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering.” [50 CFR 222.102] Harass is defined as “an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.” [50 CFR 17.3] Incidental take is defined as “takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant.” [50 CFR 402.02] The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

An incidental take statement specifies the impact of any incidental taking of threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

### **2.2.1 Amount or Extent of the Take**

NOAA Fisheries anticipates that the proposed action is reasonably certain to result in incidental take of UWR chinook salmon because of detrimental effects from increased turbidity and limited riparian habitat disturbance in the action area along the Middle Fork Willamette River, and the potential for direct incidental take during isolation of in-water work areas (non-lethal and lethal). Handling of juvenile UWR chinook salmon during the work area isolation process and transfer of fish back to the river may result in incidental take of individuals.

Effects of actions such as the one covered by this Opinion are unquantifiable in the short term, and are not expected to be measurable as long-term effects on habitat or population levels. Therefore, even though NOAA Fisheries expects some low level incidental take to occur due to the action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to estimate a specific amount of incidental take to the species itself. In instances such as these, NOAA Fisheries designates the expected level of take as “unquantifiable.” Based on the information provided by the COE and other available information, NOAA Fisheries anticipates that an unquantifiable amount of incidental take could occur as a result of the action covered by this Opinion. The extent of the take is limited to the project area, including the new millrace inlet, and 3,000 feet downstream of the millrace exit.

### **2.2.2 Reasonable and Prudent Measures**

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to avoid or minimize take of listed salmonid species resulting from the action covered by this Opinion. The COE shall include as part of the section 404 Clean Water Act permit measures that will:

1. Avoid or minimize the likelihood of incidental take of construction activities by limiting the time of in-water work as necessary to avoid harming vulnerable salmon life stages, including migration and rearing.
2. Avoid or minimize the likelihood of incidental take from construction of the new inlet structure in Clearwater Park.
3. Avoid or minimize the likelihood of incidental take from the construction of the viewing pedestrian trail, and boardwalk segment.
4. Avoid or minimize the likelihood of incidental take from in-water work by ensuring that work within the wetted channel is isolated from flowing water, and ensuring proper handling of UWR chinook.
5. Avoid or minimize the amount and extent of incidental take from construction activities in or near the river through development and implementation of effective erosion and pollution control measures throughout the area of disturbance and for the life of the project.
6. Avoid or minimize the amount and extent of take from stormwater impacts and altered stream hydraulics by implementing measures to treat water and limit fill within the 100-year floodplain.
7. Avoid or minimize the amount and extent of take from herbicide use.
8. Avoid or minimize the amount and extent of take from dredging.
9. Avoid or minimize the amount and extent of take from permanent water intake structures.
10. Ensure comprehensive monitoring and reporting to confirm this Opinion is meeting its objective of minimizing take from permitted activities.

### **2.2.3 Terms and Conditions**

To be exempt from the prohibitions of section 9 of the ESA, the COE must require, as part of the section 10 and section 404 permits, that the applicant and/or their contractors comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure #1 (in-water timing and minimizing the extent of in-water work), the COE shall ensure:
  - a. Construction impacts will be confined to the minimum area necessary to complete the project.

- i. Survey and mark the bankfull elevation<sup>5</sup> at the project site before commencement of work to delineate the permitted work area.
    - ii. All work within the active channel that can contribute sediment or toxicants to the river at the project site or to downstream fish-bearing systems will be completed between July 1 and August 31.
  - b. Extensions of the in-water work period, including those for work outside the wetted perimeter of the stream but below the bankfull elevation, must be pre-approved in writing by biologists from NOAA Fisheries.
  - c. Project operations will cease under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.
2. To implement reasonable and prudent measure #2 (construction of the new inlet structure in Clearwater Park), the COE shall ensure that:
- a. The culvert<sup>6</sup> installed shall be bottomless and of no-slope design<sup>7</sup>.
  - b. Bank stabilization near the inlet shall incorporate (with rip rap only if necessary) any combination of the following: woody plantings, herbaceous cover, deformable soil reinforcement, and coir logs.
  - c. Post construction maintenance dredging in the inlet, if necessary, is not authorized within this Opinion.
  - d. All trees removed from intake construction are placed within the bankfull elevation of the project area.
  - e. Draft culvert designs must be sent to NOAA Fisheries for written approval.<sup>8</sup>
3. To implement reasonable and prudent measure #3 (construction of the viewing pedestrian trail, and associated boardwalk segment) the COE shall ensure that:
- a. The pedestrian trail is made of pervious materials.
  - b. Maintenance of pervious materials, as necessary, occur on a regular basis to ensure proper function.

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<sup>5</sup> 'Bankfull elevation' means the bank height inundated by a 1.5 to 2-year average recurrence interval and may be estimated by morphological features such average bank height, scour lines and vegetation limits.

<sup>6</sup> For a discussion of crossing design types, see, National Marine Fisheries Service, Southwest Region, *Guidelines for Salmonid Passage at Stream Crossings* (September 2001) (<http://swr.nmfs.noaa.gov/hcd/NMFSSCG.PDF>) and Washington Department of Fish and Wildlife, *Fish Passage Design at Road Culverts: A Design Manual for Fish Passage at Road Crossings* (March 3, 1999) (<http://www.wa.gov/wdfw/hab/engineer/cm/toc.htm>).

<sup>7</sup> 'No-slope design culvert' means a culvert that is sufficiently large and installed flat to allow the natural movement of bedload to form a stable bed inside the culvert.

<sup>8</sup> The draft culvert design shall be sent to NOAA Fisheries, Attention to Keith Kirkendall and Dan Tonnes, 525 NE Oregon Street, Portland Oregon, 97232.

- c. No treated wood is used within the bankfull elevation of surface waters.
4. To implement reasonable and prudent measure #4 (isolation of in-water work area and proper fish handling methods), the COE shall ensure that:
- a. During in-water work (work within the bankfull elevation) if the project involves either significant channel disturbance or use of equipment within the wetted channel, the work area shall be well isolated from the active flowing stream within a cofferdam made out of sand bags, sheet pilings, inflatable bags, *etc.*, or similar structure, to minimize the potential for sediment entrainment. After the coffer dam is in place, any fish trapped in the isolation pool will be removed by a permitted COE and/or ODFW biologist before de-watering, using NOAA Fisheries guidelines (NOAA Fisheries 2000).
  - b. Any temporary water intake structure authorized under this Opinion must have a fish screen installed, operated and maintained in accordance to NOAA Fisheries' fish screen criteria.
    - i. Water pumped from the work isolation area will be discharged into an upland area providing over-ground flow before returning to the creek. Discharge will occur so that it does not cause erosion.
    - ii. Discharges into potential fish spawning areas or areas with submerged vegetation are prohibited.
  - c. Fish Salvage
    - iii. Before, and intermittently during, pumping attempts, efforts will be made to salvage and release fish from the work isolation area as is prudent to minimize risk of injury. If the fish salvaging aspect of this project requires the use of seine equipment to capture fish, it must be accomplished as follows:
      - (1) Seining will be conducted by or under the supervision of a fishery biologist experienced in such efforts and all staff working with the seining operation must have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.
      - (2) ESA-listed fish must be handled with extreme care and kept in water to the maximum extent possible during seining and transfer procedures. The transfer of ESA-listed fish must be conducted using a sanctuary net that holds water during transfer, whenever necessary, to prevent the added stress of an out-of-water transfer.
      - (3) Seined fish must be released as near as possible to capture sites.
      - (4) The transfer of any ESA-listed fish from the applicant to third-parties other than NOAA Fisheries personnel requires written approval from NOAA Fisheries.
      - (5) The applicant must obtain any other Federal, state, and local permits and authorizations necessary for the conduct of the seining activities.

- (6) The applicant must allow NOAA Fisheries, or its designated representative, to accompany field personnel during the seining activity, and allow such representative to inspect the applicant's seining records and facilities.
  - (7) A description of any seine and release effort will be included in a post-project report, including the name and address of the supervisory fish biologist, methods used to isolate the work area and minimize disturbances to ESA-listed species, stream conditions before and following placement and removal of barriers; the means of fish removal; the number of fish removed by species; the condition of all fish released, and any incidence of observed injury or mortality.
- iv. If the fish-salvaging aspect of this project requires the use of electrofishing equipment to capture fish, it must be accomplished as follows (NOAA Fisheries 1998):
- (1) Electrofishing may not occur in the vicinity of listed adults in spawning condition or in the vicinity of redds containing eggs.
  - (2) Equipment must be in good working condition. Operators must go through the manufacturer's preseason checks, adhere to all provisions, and record major maintenance work in a log.
  - (3) A crew leader having at least 100 hours of electrofishing experience in the field using similar equipment must train the crew. The crew leader's experience must be documented and available for confirmation; such documentation may be in the form of a logbook. The training must occur before an inexperienced crew begins any electrofishing; it must also be conducted in waters that do not contain listed fish.
  - (4) Measure conductivity and set voltage as follows:

<u>Conductivity (umhos/cm)</u>	<u>Voltage</u>
Less than 100	900 to 1100
100 to 300	500 to 800
Greater than 300	150 to 400
  - (5) Direct current (DC) must be used at all times.
  - (6) Each session must begin with pulse width and rate set to the minimum needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured. Start with pulse width of 500us and do not exceed 5 milliseconds. Pulse rate should start at 30Hz and work carefully upwards. *In general*, pulse rate should not exceed 40 Hz, to avoid unnecessary injury to the fish.
  - (7) The zone of potential fish injury is 0.5m from the anode. Care should be taken in shallow waters, undercut banks, or where fish

can be concentrated because in such areas the fish are more likely to come into close contact with the anode.

- (8) The monitoring area must be worked systematically, moving the anode continuously in a herringbone pattern through the water. Do not electrofish one area for an extended period.
- (9) Crew must carefully observe the condition of the sampled fish. Dark bands on the body and longer recovery times are signs of injury or handling stress. When such signs are noted, the settings for the electrofishing unit may need adjusting. Sampling must be terminated if injuries occur or abnormally long recovery times persist.
- (10) Whenever possible, a block net must be placed below the area being sampled to capture stunned fish that may drift downstream.
- (11) The electrofishing settings must be recorded in a logbook along with conductivity, temperature, and other variables affecting efficiency. These notes, together with observations on fish condition, will improve technique and form the basis for training new operators.

- iii. Include the following notice in writing to each party that will supervise completion of the action:

NOTICE. If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify the Vancouver Field Office of NOAA Fisheries Law Enforcement at 360.418.4246. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

- 5. To implement reasonable and prudent measure #5 (erosion and pollution control), the COE will ensure that:

- a. The Contractor will develop and implement a site-specific spill prevention, containment, and control plan (SPCCP), and is responsible for containment and removal of any toxicants released. The Contractor will be monitored by the COE to ensure compliance with this SPCCP. The plan must contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.
  - I. Practices to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.

- ii. Practices to confine, remove and dispose of excess concrete, cement and other mortars or bonding agents, including measures for washout facilities.
  - iii. A description of any hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.
  - iv. A spill containment and control plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.
- b. Construction discharge water. All discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water) will be treated as follows:
- v. Water quality. Facilities must be designed, built and maintained to collect and treat all construction discharge water using the best available technology applicable to site conditions. The treatment must remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.
  - vi. Discharge velocity. If construction discharge water is released using an outfall or diffuser port, velocities must not exceed 4 feet per second and the maximum size of any aperture may not exceed one inch.
  - vii. Spawning areas. No construction discharge water may be released within 300 feet upstream of UWR chinook salmon spawning areas.
  - viii. Pollutants. Do not allow pollutants including green concrete, contaminated water, silt, welding slag, sandblasting abrasive, or grout cured less than 24 hours to contact any wetland or the 2-year floodplain
- c. Heavy equipment. Restrict use of heavy equipment as follows.
- I. Choice of equipment. When heavy equipment will be used, the equipment selected will have the least adverse effects on the environment (*e.g.*, minimally sized, low ground pressure equipment).
  - ii. Vehicle and material staging. Store construction materials, and fuels; and operate, maintain, and store vehicles as follows:
    - (2) Complete vehicle staging, cleaning, maintenance, refueling, and fuel storage in a vehicle staging area placed 150 feet or more from any stream, waterbody or wetland, unless otherwise approved in writing by NOAA Fisheries.
    - (3) Inspect all vehicles operated within 150 feet of any stream, waterbody or wetland daily for fluid leaks before leaving the vehicle staging area. Repair any leaks detected in the vehicle staging area before the vehicle resumes operation. Document inspections in a record that is available for review on request by COE or NOAA Fisheries.
    - (4) Before operations begin and as often as necessary during operation, steam clean all equipment that will be used below

- bankfull elevation until all visible external oil, grease, mud, and other visible contaminants are removed.
- (5) Diaper all stationary power equipment (*e.g.*, generators, cranes, stationary drilling equipment) operated within 150 feet of any stream, waterbody or wetland to prevent leaks, unless suitable containment is provided to prevent potential spills from entering any stream or waterbody.
  - d. Material removed during excavation will only be placed where it cannot enter streams, wetlands, or other waterbodies.
  - e. The following erosion and pollution control materials are onsite:
    - I. A supply of erosion control materials (*e.g.*, silt fence and straw bales) is on hand to respond to sediment emergencies. Sterile straw or hay bales will be used when available to prevent introduction of weeds.
    - ii. An oil-absorbing, floating boom is available on-site during all phases of construction. The boom must be of sufficient length to span the wetted channel.
    - iii. All temporary erosion controls (*e.g.*, straw bales, silt fences) are in place and appropriately installed downslope of project activities within the riparian area. Effective erosion control measures will be in place at all times during the contract, and will remain and be maintained until such time that permanent erosion control measures are effective.
  - f. All exposed or disturbed areas resulting from the proposed project will be stabilized to prevent erosion.
    - I. Areas of bare soil within 150 feet of waterways, wetlands or other sensitive areas will be stabilized by native seeding,<sup>9</sup> mulching, and placement of erosion control blankets and mats, if applicable, but within 14 days of exposure.
    - ii. All other areas will be stabilized quickly as reasonable, but within 14 days of exposure.
    - iii. Seeding outside of the growing season will not be considered adequate nor a permanent stabilization.
  - g. All erosion control devices will be inspected during construction to ensure that they are working adequately.
    - I. Erosion control devices will be inspected daily during the rainy season, weekly during the dry season, monthly on inactive sites.
    - ii. If inspection shows that the erosion controls are ineffective, work crews will be mobilized immediately, during working and off-hours, to make repairs, install replacements, or install additional controls as necessary.

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<sup>9</sup> By Executive Order 13112 (February 3, 1999), Federal agencies are not authorized to permit, fund or carry out actions that are likely to cause, or promote, the introduction or spread of invasive species. Therefore, only native vegetation that is indigenous to the project vicinity, or the region of the state where the project is located, shall be used.

- h. If soil erosion and sediment resulting from construction activities is not effectively controlled, the COE will limit the amount of disturbed area to that which can be adequately controlled.
  - I. Sediment will be removed from sediment controls once it has reached 1/3 of the exposed height of the control. Whenever straw bales are used, they will be staked and dug into the ground four inches. Catch basins will be maintained so that no more than six inches of sediment depth accumulates within traps or sumps.
  - j. Sediment-laden water created by construction activity will be filtered before it leaves the right-of-way or enters a stream or other waterbody. Silt fences or other detention methods will be installed as close as reasonable to culvert outlets to reduce the amount of sediment entering aquatic systems.
  - k. Any hazardous materials spill will be reported to NOAA Fisheries, the Environmental Protection Agency, and the state of Oregon DEQ.
    - I. In the event of a hazardous materials or petrochemical spill, immediate action shall be taken to recover toxic materials from further impacting aquatic or riparian resources.
    - ii. In the event of a hazardous materials or petrochemical spill, a detailed description of the quantity, type, source, reason for the spill, and actions taken to recover materials will be documented. The documentation should include photographs.
6. To implement reasonable and prudent measure # 6 (new impervious surface and stormwater management)<sup>10</sup> the COE shall ensure that:
- a. Stormwater must be infiltrated or dispersed onsite to the maximum extent possible without causing flooding or erosion impacts.
  - b. When stormwater runoff must be discharged into a freshwater system, the following requirements apply.
    - I. The area must be drained by a conveyance system comprised entirely of manufactured elements (*e.g.*, pipes, ditches, outfall protection) that extends to the ordinary high water line of the receiving water.
    - ii. Any erodible elements of this system must be adequately stabilized to prevent erosion.
    - iii. Surface water from the area must not be diverted from or increased to an existing wetland, stream or near-shore habitat sufficient to cause a significant adverse effect.
    - iv. Runoff treatment facilities must be designed, built and maintained to collect runoff from the project site using the best available technology applicable to the site conditions. Treatment must be provided to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.

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<sup>10</sup> Including, but not limited to, the relocated boat launch parking lot.

7. To implement reasonable and prudent measure #7 (herbicide application), the COE shall ensure:
- a. No herbicides, surfactants, or other adjuvants other than those identified in the proposed action are applied.
  - b. The contracted applicator is aware of the provisions of this Opinion before commencing herbicide application operations.
  - c. The contracted applicator has a spill response plan and is familiar with use of the spill kit before commencing herbicide application operations.
  - d. All chemical storage, chemical mixing, and post-application equipment cleaning is completed in such a manner as to prevent the potential contamination of any riparian area, perennial or intermittent waterway, ephemeral waterway, or wetland.
  - e. Erosion control measures (*e.g.*, silt fence, native grass seeding) are used where de-vegetation may result in the significant delivery of sediment to LCR steelhead or LCR chinook salmon habitat.
  - f. No in-water use.
  - g. Application will be limited to fall when plants are becoming dormant.
  - h. Application will occur with sport spraying techniques from a backpack mounted applicator.
  - i. No broadcast spraying will occur.
  - j. No herbicide application will occur after the first year post-construction.
  - k. Herbicides will be applied only to non-native plants that have been previously grubbed.
8. To implement reasonable and prudent measure #8 (dredging), the COE shall ensure that:
- a. Before removal or grading of sediments, the applicant will complete sediment testing to establish potential contaminant concentrations.
    - i. Samples should be well distributed above the millpond dam and the stormwater infiltration pond.
    - ii. Samples shall remain distinct and not composited.
    - iii. Sample depth shall be at least 1.5 feet below surface. Other sampling protocols shall follow the Dredge Material Evaluation Framework<sup>11</sup>.
    - iv. At a minimum, sediment samples shall be tested for copper, zinc, nickel, arsenic, chromium, lead, phenols, and PAHs concentrations. Those sediment samples that exceed the threshold listed below shall result in upland sediment disposal for contaminated areas; Arsenic- 10,798 parts per billion (ppb); Copper: 28,012 ppb; Phenols: 420 mg/kg (DMEF); PAH

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<sup>11</sup> See, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Washington Department of Ecology, and Washington Department of Natural Resources, *Dredged Material Evaluation Framework: Lower Columbia River Management Area* (DMEF) (November 1998) (procedures to determine sediment quality for dredging activity) (<http://www.nwp.usace.army.mil/ec/h/hr/Final/>).

(LMW):76.42 ppb, PAH (HMW): 192.95 ppb; Zinc: 98,000 ppb; Nickel: 19,514 ppb; Chromium: 36,286 ppb; Lead: 37,000 ppb. Unless otherwise noted, all values are from NOAA (1999b).

- c. All dredging is completed within the in-water work period between July 1 and August 31. Any adjustments to the in-water work period must be approved in writing by NOAA Fisheries.
  - d. To minimize turbidity effects and upstream movement of contaminants, dredging shall only occur within waters excluded from active flow out of the project area.
  - e. Operate dredges as follows:
    - I. Keep hydraulic dredge intakes at or just below the surface of the material being removed, although the intake may be raised for brief periods of purging or flushing.
    - ii. Use clamshell dredges with a finishing type bucket with flaps, whenever feasible.
    - iii. Place dredge spoil in an approved upland area where it cannot reenter the waterbody and that is large enough to allow settling.
9. To implement reasonable and prudent measure #9 (permanent water intake structures ), the COE shall ensure that:
- a. The McKenzie Forest Products pumphouse and Gorrie Creek fish screens conform to the NOAA Fisheries juvenile fish screen criteria<sup>12</sup> and draft designs shall be sent to NOAA Fisheries for written approval.<sup>13</sup>
  - b. The McKenzie Forest Product and Springfield Utility Board percolation pond have no increased capacity<sup>14</sup> for consumptive water use from the proposed action.
10. To implement reasonable and prudent measure #13 (monitoring), the COE shall:
- a. Ensure that a monitoring report is submitted within 120 days of project completion describing project implementation. Each project level monitoring report will include the following information
  - b. Dates work ceased due to high flows, if any.
  - c. Evidence of compliance with NOAA Fisheries' fish screen criteria.

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<sup>12</sup> National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (<http://www.nwr.noaa.gov/1hydroweb/hydroweb/ferc.htm>).

<sup>13</sup> The draft screen designs shall be sent to NOAA Fisheries, Attention to Keith Kirkendal and Dan Tonnes, 525 NE Oregon Street, Portland Oregon, 97232.

<sup>14</sup> “Increased capacity” is defined as infrastructure or delivery efficiency which enables greater water withdrawal than current capacities and actual withdrawals.

- d. A summary of pollution and erosion control inspections, including any erosion control failure, contaminant release, and correction effort.
- e. Starting and ending dates for work completed.
- f. Isolation of in-water work area, capture and release information shall include:
  - I. Supervisory fish biologist – name and address
  - ii. Methods of work area isolation and take minimization.
  - iii. Stream conditions before, during and within one week after completion of work area isolation.
  - iv. Means of fish capture.
  - v. Number of fish captured by species.
  - vi. Number of fish captured by species.
  - vii. Any incidence of observed injury or mortality of listed species.
- g. Dredging information shall include:
  - I. Approximate plume of dredged material.
  - ii. Water depth before dredging and within one week of completion.
  - iii. Verification of upland dredge disposal, if necessary.
  - iv. A copy of the sediment test results.
  - v. An outline for an analysis of effects of any remaining contaminants on ESA-listed salmonid fishes and their habitat.

### **3. MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT**

#### **3.1 Background**

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of EFH: “Waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle (50CFR600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;
- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reason for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

### **3.2 Identification of EFH**

The Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Pacific salmon: Chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other waterbodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based on this information.

### **3.3 Proposed Action**

The proposed action is detailed above in section 1.2 of this document. The action area is the full length of the Millrace, downstream to approximately 3,000 feet below the exit of the Millrace water to the Middle Fork Willamette River. This area has been designated as EFH for various life stages of chinook salmon.

### **3.4 Effects of Proposed Action**

As described in detail in the ESA portion of this consultation, the proposed activities would result in detrimental, short-term, adverse effects to a variety of habitat parameters.

### **3.5 Conclusion**

NOAA Fisheries believes that the proposed action will adversely affect the EFH for coho salmon and chinook salmon.

### **3.6 EFH Conservation Recommendations**

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that would adversely affect EFH. In addition to conservation measures proposed for the project by the COE, all of the reasonable and prudent measures and the terms and conditions contained in sections 2.2.2 and 2.2.3, respectively, of the ESA portion of this Opinion are applicable to salmon EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

### **3.7 Statutory Response Requirement**

The MSA (section 305(b)) and 50 CFR 600.920(j) requires the COE to provide a written response to NOAA Fisheries' EFH conservation recommendations within 30 days of its receipt of this letter. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. If the response is inconsistent with NOAA Fisheries' conservation recommendations, the COE shall explain its reasons for not following the recommendations.

### **3.8 Supplemental Consultation**

The COE must reinitiate EFH consultation with NOAA Fisheries if either the action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

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